

ART. XXII.—*On the Seasoning of Hardwoods.*

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The results given in this paper do not claim to settle, in any way, the question of seasoning, but are rather a record of accurate observations made on our timber when treated in various ways. In the discussions on seasoning, opinion is more often quoted than observation.

Steaming of timber, prior to seasoning, has many advocates, and this process has been given a good deal of attention. In the Botanical Laboratory, we have only been able to use 2 ft. lengths, but I do not think that this has any marked effect on the result. It may, however, since the wood vessels in the tall eucalypts are very long, and hence the steam may find its way right into the wood. If the wood be saturated with moisture, when it is put into the steam bath, it is difficult to see how the wood could dry, since the air is also saturated. On the other hand, if the wood be partly seasoned, then it ought to take up moisture. The latter case was not investigated. In the former case, however, all specimens weighed approximately the same when taken out as when put in. Steaming may, as Tiemann points out, prove a ready means of heating the wood, but the same result could probably be secured in another way. In the former experiments, the results of which are published in the Proc. Roy. Soc. Victoria, Mountain Ash (*Eucalyptus regnans*) was mainly used, but in this series *Messmate* (*E. obliqua*) was mainly used. The general results are the same. In the first place there is no acceleration of drying after steaming. Typical examples are given below. The weights are given as percentages of original weight. The boards were 6 in. x 1 in. *Messmate*, and were all cut from the same length of timber.

Date	Treatment.			
	In air	24 hrs. in steam	Air	48 hrs. in steam
	%	%	%	%
4/11/18	100	100	100	100
9/11/18	91.5	87.5	90.9	89.3
19/11/18	82.8	82.7	83.8	80.8
29/11/18	77.4	75.8	76.7	75.5
16/12/18	68.8	69.0	69.7	68.1
8/1/19	65.6	65.5	66.7	63.8
28/1/19	64.5	64.4	65.6	62.8
14/2/19	64.5	64.4	64.7	63.8

It will be seen that the specimen steamed for 48 hours has lost slightly more than the others. This is often the case, as tannin and kino are dissolved out of the wood.

While the drying rate is not affected, the amount of shrinkage is seriously affected. Two typical cases are given. The timber was 6 in. x 1 in. messmate. The first specimen was steamed for six hours, and then put out in the air to dry. The corresponding piece was left in the air.

			Steamed		Unsteamed	
Shrinkage	{	Breadth	-	$\frac{1}{32}$ in.	-	$\frac{1}{32}$ in.
		Depth	-	$\frac{3}{32}$ in.	-	$\frac{3}{32}$ in.

The second specimen was steamed for 12 hours.

			Steamed		Unsteamed	
Shrinkage	{	Breadth	-	$\frac{1}{16}$ in.	-	$\frac{1}{16}$ in.
		Depth	-	$\frac{4}{32}$ in.	-	$\frac{3}{32}$ in.

It will be seen that the steaming has greatly increased the amount of shrinkage. The cause of this extra shrinkage is not yet known, but it may be due either to the steam affecting the union of the cells or the constitution of the cell wall may be affected.

A very interesting result was obtained by cutting a length of 6 in. x 1 in. timber into 10 in. lengths, and subjecting each piece to a different mode of treatment before putting it out in the air to dry.

The result of one experiment is as follows:—

Date	Treatment						
	In air		2 hrs. in steam at 10 lbs. pres.		2 hrs. in steam at atmos. p.		In oven at 110°c
	%	-	%	-	%	-	
7/11/18	100	-	100	-	100	-	100
9/11/18	97.4	-	95.4	-	96.8	-	93.1
19/11/18	89.9	-	88.5	-	89.2	-	88.6
29/11/18	86	-	83	-	84.3	-	84.7
16/12/18	80.8	-	78.3	-	79.5	-	79.7
8/1/19	78.6	-	76	-	77.6	-	77.4
28/1/19	77.8	-	75.2	-	77.9	-	76.6
14/2/19	77.7	-	74.9	-	76.9	-	76.4

The weights are given as percentages of the original weights. It will be noticed that the piece treated at 10 lbs. pressure of steam is the lightest. This is due to various substances being dissolved out of the wood. The interesting feature of the experiment lies in the fact that all the pieces have dried approximately at the same rate. With the exception of the second weighing, the difference between any pair of weights never exceeds 3% at any weighing, and in this 3% difference must be included the loss of

tannin and kino. The difference between the un-treated specimen and the oven-treated specimen is very small. Other experiments gave the same results. Hence we may conclude that sudden drying of the surface does not affect the ultimate rate of drying.

The amount of shrinkage in breadth of these specimens is also of interest:—

Shrinkage	Treatment			
	In Air	10 lbs. steam	Steam at atmos. p.	Oven at 110
-	$\frac{17}{32}$	- $\frac{18}{32}$	- $\frac{17}{32}$	- $\frac{16}{32}$

These results are similar to those of other experiments. It will be seen that the suddenly dried specimen gives the least shrinkage.

The amount of shrinkage that takes place when our timber is seasoning, is highly important. The measurements taken are not extensive, but they should prove a guide for future work.

Measurements were made on both Messmate and Mountain Ash. In length the shrinkage is very small, and averaged  $1/32$  in. for 6 ft. Lengths from 2 ft. to 6 ft. were used.

For shrinkage in radial and tangential direction, 6 in. x 1 in. boards were used mainly. The shrinkage in a tangential direction is generally supposed to be much greater than in a radial direction, but the difference was not as great as expected. The results for Mountain Ash (*E. regnans*) are as follows:—

In the radial direction the shrinkage averaged—

$\frac{19}{32}$  in. for 6 in. or about 5%.

In the tangential direction the shrinkage averaged—

$\frac{1}{2}$  in. for 6 in. or about 8%.

For Messmate the results were as follows:—

In the radial direction the shrinkage averaged—

$\frac{13}{32}$  in for 6 in. or about 6%.

In the tangential direction the average was—

$\frac{15}{32}$  for 6 in. or about 8%.

It is still a debated question as to how long it takes our timber to season in the open air. Apparently no accurate observations have been made, and hence doubt exists. In my former paper I gave some observations on the drying of a stack of timber. Another stack was made in January of this year. The boards were 6 in. x 1 in., and were placed horizontally with 1 in. fillets between them. Laterally there was a 3 in. space between boards. There were 30 boards in the stack, each 6 ft. The stack was not in the

most favourable position for drying, since it was shut in by walls on three sides, and was beneath an elm tree. The lowest humidity recorded was 13%, and this was on the day of the disastrous fires in the Otway Ranges. All the boards dried in about four weeks. The percentage of moisture remaining was about 12 %, this being the average of three boards.

The actual and percentage weights of the boards that lost most are as follow :—

Date	Weight	%	Weight	%
18/1/19	- 16.6	- 100	- 16	- 100
25/1/19	- 13.3	- 80.6	- 12.5	- 76.9
1/2/19	- 11.14	- 72.5	- 10.15	- 68.4
8/2/19	- 10.15	- 66.8	- 10.1	- 62.9
15/2/19	- 10.6	- 63.4	- 9.12	- 60.9
22/2/19	- 10.5	- 63.0	- 9.14	- 61.7
1/3/19	- 10.4	- 62.6	- 9.14	- 61.7

It will be noticed that the latter one began to weigh more. This is always the case with dry boards, for they vary with the humidity of the atmosphere. The result of this experiment indicates the need for more extensive observations on the natural drying of timber in our climate, especially during the summer. If inch boards can be seasoned by a month's air drying in summer time, to kiln-dry such boards would be quite unnecessary and would hardly save any time. I desire to thank the manager of the Victorian Hardwood and Milling Co., and also Messrs. R. Grundy and Co., for their care and promptness in supplying the timber for these experiments.